[0099] Circuit-switched (CS) fallback for EPS (CSFB) procedures are used today in some 3GPP based networks in order to support voice services and short message services prior to the introduction of VoLTE. 3GPP has standardized CSFB in stage 2 level in 3GPP TS 23.272. CSFB supports the capability to perform emergency calls via CS access.

[0100] VoLTE capable UEs in many markets may have in parallel support for CSFB. In this respect CSFB may be used to complement some missing functionalities from early VoLTE deployment such as roaming, emergency calls, as well as short message services to name a few. Also, terminals having support for VoLTE may be expected to support CSFB procedures and CS radio access technologies.

[0101] Text Telephony (TTY) methods are standardized in ITU-T as part of V.18 (V.18: Operational and interworking requirements for modems operating in the text telephone mode) in order to enable hearing impaired subscribers to establish voice calls, but instead of using voice, they can use text communication which is carried as part of the voice channel as an encoded signal. V.18 is used in today's PSTN networks.

[0102] In at least some mobile network (GSM/3G) markets similar requirements exist to support text telephony. Due to the different nature of mobile technologies use of V.18 over the air interface has been considered to be problematical and alternative technology was developed by 3GPP. It is known as Cellular Text telephony Modem (CTM) and defined as part of Global Text Telephony (GTT). When a terminal having attached TTY equipment/capability establishes a voice call it informs the network of the requirement for CTM support. CTM related functionality may reside in transcoding equipment since the actual text communication is embedded within speech frames that are interpreted by the transcoding equipment. Transcoding can be performed either at the base station or in the core network depending on the network architecture.

[0103] Transcoding in this context may be considered as conversion between CTM and V.18. The V.18 may be used inside the core network and the CTM may be used in the radio access network.

[0104] In 3GPP IMS architecture the use of CTM is not standardized. Instead, another protocol known as T.140 (real time text telephony) has been mandated. In a case where an IMS subscriber calls a PSTN subscriber using TTY then there is a need to also perform conversion between T.140 and V.18 within IMS. This may be performed in IM-MGW (see 3GPP TS 29.163) under control of the Media Gateway Control Function (MGCF).

[0105] TTY may, in at least some regions, also be a requirement for IMS emergency calls that are established by VoLTE subscribers.

[0106] Single Radio Voice Call Continuity (SRVCC) makes it possible to continue established voice calls even in a case where LTE coverage is no longer available and the call was originally established as a VoIP call in the IMS domain. The network, together with the terminal, and by using procedures as defined in 3GPP TS 23.216, may perform access domain transfer from LTE (IMS) to CS domain. 3GPP Release 9 further enhanced SR-VCC procedures to support IMS emergency calls also. That is SRVCC allows for handover between a packet-switched call in LTE and a circuit-switched call in a legacy system, such as WCDMA.

[0107] In a case where a VoLTE UE is capable of using Text Telephony in the context of an IMS call (which may be an emergency call), but the LTE coverage provided by the network is not sufficient in all areas within the network, the VoLTE UE may require use of SR-VCC to enable the call to be continued when the LTE coverage is no longer available.

[0108] The current 3GPP specifications do not specify interworking between SRVCC and Text Telephony based on the T.140 protocol. Thus it may not be possible in practise to use IMS emergency call with T.140 in a case where SRVCC is needed in the network deployment, and the T.140 component may be removed from an ongoing emergency call after the SRVCC has occurred. This can be appreciated from FIG. 4.

[0109] FIG. 4 shows signalling between a UE 402, an evolved packet system (EPS) server 404, a single radio voice call continuity mobile switching centre server (SRVCC-MSS) 406, a proxy call state control function (P-CSCF) 408, an emergency call state control function (E-CSCF) 410, an emergency access transfer function (EATF) 412, a media gateway control function 414, and a public safety answering point (PSAP) 416. Communications between the EATF 412 and the MGCF 414 occur over the IMS network i.e. are packet switched. Communications between the MGCF 414 and the PSAP 416 are circuit switched.

[0110] In this example, at step S1 the UE 402 sends an INVITE message to the P-CSCF 408. This INVITE message comprises SOS, SDP, text, and audio components. The "SOS" component indicates that this is an emergency call. Accordingly, at step S2 the INVITE message is forwarded to the E-CSCF 410. At this point the emergency call is anchored with the EATF 412 in the IMS network (step S3). Information regarding the anchoring may be visible in Via and Record Route headers. The Emergency SRVCC may be initiated by EPS based on a dedicated emergency bearer. At step S4 the E-CSCF 410 forwards the INVITE message to the MGCF 414.

[0111] Upon receipt of the INVITE message, at step S5 the MGCF 414 responds with a SIP message 2000K (INVITE) message to the UE (after an Answer Message (ANM) is received from PSAP). Also, at step S6 the MGCF 414 sends an IAM (B#=PSAP number) message to the PSAP 416 then, with the connections in place, at step S7 the MGCF 414 (and more particularly the IM-MGW) can begin to transcode between T.140 text component (as used in the IMS network) and the V.18 component which is suitable for the PSAP 416 in the circuit switched network. This is shown at step S8 where the UE 402 is shown communicating with the MGCF 414 using the AMR (adaptive multi-rate) codec and the T.140 component, whereas the MGCF 414 communicates with the PSAP 460 using the V.18 protocol and G.711 audio.

[0112] At step S9 the SRVCC occurs in E-UTRAN. As part of this, the UE sends measurement reports to the eNodeB, where detections are carried out and the eNodeB requests the PS to CS handover from MME. The MME can determine that it is an emergency based on the dedicated bearer.

[0113] In response to this, at step S10 a request to move from a packet switched connection to a circuit switched connection is sent from the EPS 404 to the SRVCC-MSS 406. At step S11 an INVITE is sent from the SRVCC-MSS 406 to the EATF 412. The EATF can then renegotiate the